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June 2017

IUJ Research Institute
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SPATIAL INEQUALITIES IN INDONESIA, 1996-2010: A HIERARCHICAL DECOMPOSITION ANALYSIS*

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Abstract

This study analyzes spatial inequalities in Indonesia from 1996-2010 using the hierarchical decomposition method. It uses household expenditures rather than regional accounts and tries to investigate the contributions of spatial inequalities to overall expenditure inequality. We find that urban-rural disparity constitutes 15-25% of overall expenditure inequality. A large difference exists between urban and rural areas in the magnitude of inequality among districts. After controlling for the urban and rural difference, inequality among districts accounts for 15-25% of overall inequality. While disparity between five major island regions is negligible, inequalities between districts within provinces appear to have played an increasingly important role in both urban and rural areas. Given unequal geographic distributions of resource endowments, public infrastructure and economic activities, some spatial inequalities are inevitable. Nevertheless, sustained efforts are necessary to reduce spatial inequalities to facilitate national unity, cohesion and stability.

Key Words: spatial inequality; expenditure inequality; hierarchical decomposition of inequality; Theil index; Indonesia

JEL: O15; O18; R12

* The authors are grateful to the Japan Society for the Promotion of Science for its financial support (Grant-in-Aid for Scientific Research No.15K03458 and 15K03473). Earlier versions of the paper were presented at the 4th PRSCO (Pacific Regional Science Conference Organization) Summer Institute in Bangkok, Thailand, June 27-29, 2016 and the 13th IRSA (Indonesian Regional Science Association) International Conference in Malang, East Java, Indonesia, July 25-26, 2016. The authors would like to thank Federico Revelli for his helpful comments and Heryanah for obtaining the necessary data for our analysis. The authors would also like to thank anonymous reviewers for their helpful comments.

1. Introduction

A number of studies have been conducted to analyze regional development dynamics and the evolution of inter-regional income inequalities in Indonesia, as large differences in socio-economic indicators persist among its regions and provinces due largely to unequal distributions of resource endowments, public infrastructure and economic activities.¹ The capital province of Jakarta, for example, has the largest per capita GDP, but it is followed by the resource-rich provinces of East Kalimantan, Riau and Papua. Meanwhile, conflict-ridden North Maluku registers the smallest and the ratio of the largest to smallest per capita GDP is 18.

In order to mitigate inter-regional inequalities and to cope with periodic secessionist movements, Indonesia embarked on the so-called ‘Big Bang’ decentralization in 2001 (World Bank, 2003; Fitriani, Hofman and Keiser, 2005).² Under decentralization, the central government is responsible for religious affairs, national defense and security, judicial system, fiscal and monetary policy, foreign affairs and other specially designated functions such as macroeconomic planning and national standards, while authority over and responsibilities for most other functions, including education, health management and public works is devolved to regional governments, particularly district (*kabupaten* and

¹ See, for example, Esmara (1975), Uppal and Budiono (1986), Akita (1988), Hill (1992), Akita and Lukman (1995), Garcia Garcia and Soelistianingsih (1998), Akita and Lukman (1999), Tadjoeeddin, Suharyo and Mishra (2001), Akita and Alisjahbana (2002), Akita (2003), Resosudarmo and Vidyattama (2006), Hill (2008), Hill, Resosudarmo and Vidyattama (2008), Akita, Kurniawan and Miyata (2011), Akita and Miyata (2013), Vidyattama (2013), Hayashi, Kataoka and Akita (2014) and Hill and Vidyattama (2014).

² Two decentralization laws, Law 22 in 1999 on Regional Government and Law 25 in 1999 on the Fiscal Balance between the Central Government and the Regions, were promulgated in 1999 in the aftermath of the 1997/98 financial crisis and the subsequent fall of the Suharto regime. They were implemented in 2001. Under Law 22/1999, the hierarchical governance system linking district governments to the central government was replaced by the system where district governments are granted considerably greater autonomy (Brodjonegoro and Asanuma, 2000; Silver, Azis and Schroeder, 2001). Under Law 25/1999, autonomous region subsidy (SDO: Subsidi Daerah Otonom) and presidential instruction including grants (Inpres: *Instruksi Presiden*) were abolished and replaced by inter-governmental transfers developing general allocation grants (DAU: *Dana Alokasi Umum*), special allocation grants (DAK: *Dana Alokasi Khusus*) and shared revenues from natural resources and taxes (DBH: *Dana Bagi Hasil*) (Lewis, 2001; Silver, Azis and Schroeder, 2001). Currently, revenues of regional governments consist mainly of these inter-governmental transfers, own source revenues (PAD: *Pendapatan Asli Daerah*) and regional government borrowings.

kota) governments (Brodjonegoro and Asanuma, 2000; Alm, Aten and Bahl, 2001). Decentralization is expected to make the government closer to the people, thereby ensuring the effective and efficient provision of public services in line with local needs and costs (Oates, 1999). However, its effects on inter-regional inequalities remain uncertain.

Most previous studies on inter-regional inequalities in Indonesia were based on regional accounts data, such as gross regional domestic product (GRDP) and gross regional domestic expenditure (GRDE), either at the provincial or district level. However, even under fiscal decentralization, much of revenues generated from oil and natural gas and certain proportions of revenues from other natural resources have still accrued to the central government, and thus GRDP or GRDE is not a good indicator of regional welfare levels. The main objective of our study is to analyze spatial inequalities in Indonesia from 1996-2010; unlike most previous studies, however, our study employs household expenditure data rather than regional accounts data. By applying the hierarchical inequality decomposition method of the Theil indices, developed by Akita (2003) and extended by Akita and Miyata (2013), to household expenditure data from the National Socio-economic Survey (*Susenas*), it examines the contributions of inequalities between spatial units to overall expenditure inequality among households in two hierarchical spatial frameworks, i.e., ‘sector (urban and rural)-district’ and ‘region-province-district’ frameworks (see Figure 1).³

Among the questions that are addressed in this study are the following. First, to what extent is urban-rural disparity responsible for overall expenditure inequality? Have there been any changes in its contribution to overall inequality in the 1996-2010 period? Second, is there any difference between the urban and rural sectors in the magnitude of inequality

³ In this study, Indonesia is divided into five regions: Sumatra, Java-Bali, Kalimantan, Sulawesi and Eastern Indonesia, where Eastern Indonesia includes the provinces of East Nusa Tenggara, West Nusa Tenggara, Maluku, North Maluku, Papua and West Papua. Provinces in each of these five regions are made up of districts. Provinces and districts have their own local governments and parliamentary bodies.

among districts (*kabupatens and kotas*)? To what extent does inequality among districts contribute to overall expenditure inequality, after controlling for the urban-rural difference? Have there been any changes in its contribution to overall expenditure inequality? Third, among inter-regional, inter-provincial and inter-district inequalities, which spatial inequality contributes most to expenditure inequality in urban and rural areas? Here, inter-provincial and inter-district inequalities are defined, respectively, as a weighted average of inter-provincial inequalities within regions (i.e., Sumatra, Java-Bali, Kalimantan, Sulawesi and Eastern Indonesia) and a weighted average of inter-district inequalities within provinces (i.e., Sumatra provinces, Java-Bali provinces, etc.).

We find that urban-rural disparity accounts for around 15-25% of overall expenditure inequality in the study period. Meanwhile, a large difference exists between urban and rural areas in the magnitude of inequality among districts; after controlling for the urban-rural difference, the inequality accounts for 15-25% of overall inequality. While disparity between five major island regions is negligible, inequalities between districts within provinces appear to have played an increasingly important role in both urban and rural areas.

2. Literature Review

When measuring spatial inequality, we should distinguish three approaches (Kanbur and Venables, 2005; Milanovic, 2005). The first approach concerns unweighted variation in per capita GDP across regions. It compares regions in terms of their per capita GDP, but ignoring their population sizes. Regional convergence analysis advanced by Barro and Sala-i-Martin (1992, 1995) is an example of the first approach. In Indonesia, Garcia Garcia and Soelistianingsih (1998), Shankar and Shah (2003), Resosudarmo and Vidyattama (2006), Hill, Resosudarmo and Vidyattama (2008), and Vidyattama (2010, 2013)

conducted a regional convergence analysis using provincial and/or district-level per capita GDP data. The first approach, however, does not offer a measure of inequality among individuals. It is, thus, legitimate to consider the second type of spatial inequality.

The second approach concerns population-weighted variation in per capita GDP across regions. An analysis based on the population-weighted coefficient of variation introduced by Williamson (1965) is an example of the second approach. Since the population size varies substantially among spatial units, the second approach should provide a better picture of spatial inequality. In Indonesia, West Java is the largest province, accounting for 18.2% of total population, while West Papua is the smallest with merely 0.3%. Unweighted inequality measures thus overstate (understate) deviations of smaller (larger) spatial units in per capita GDP from the national average; this would give biased messages to policy makers (Akita and Miyata, 2010). In Indonesia, studies in the second approach include Esmara (1975), Uppal and Budiono (1986), Akita (1988), Akita and Lukman (1995), Tadjoeeddin, Suharyo and Mishra (2001), Shankar and Shah (2003), Akita, Pudji and Miyata (2011), Vidyattama (2013), and Hill and Vidyattama (2014).

The third approach uses individuals or households as the unit of analysis. By using additively decomposable inequality measures (e.g., generalized entropy class of measures), it assesses the contribution of income variation among spatial units to variation among all individuals or households. It is usually referred to as spatial decomposition of income inequality. Shorrocks and Wan (2005) presented basic properties of spatial decomposition of inequality. Our study follows the third approach; but it extends the approach and analyzes patterns of spatial inequality in the two hierarchical spatial frameworks mentioned above. Some of the studies employing the third approach in Indonesia are Akita and Lukman (1999), Skoufias (2001), Tadjoeeddin, Suharyo and Mishra (2001), Akita and Miyata (2008), Yusuf, Sumner and Rum (2014), Hayashi, Kataoka and Akita (2014) and

Chongvilaivan and Kim (2016).

Akita and Lukman (1999) used household expenditure data for 1987-1993 from *Susenas* to assess the contribution of inter-provincial inequality to overall expenditure inequality as measured by the Theil indices. Tadjoeeddin, Suharyo and Mishra (2001) conducted a similar research based on updated *Susenas* data. According to these studies, inter-provincial inequality accounted for around 15-20% of overall expenditure inequality in the 1990s. Akita and Lukman (1999) also conducted an inequality decomposition analysis by urban and rural areas and found that the contribution of the urban-rural disparity to overall inequality was around 20-25% for 1987-1993. Akita and Miyata (2008) and Hayashi, Kataoka and Akita (2014) did an updated analysis, respectively, for 1996-2002 and 2008-2010. Using the Theil T index, these studies observed that the disparity between urban and rural areas accounted for 15-20% of overall expenditure inequality.⁴ Hayashi, Kataoka and Akita (2014) also conducted a decomposition analysis by five regions: Sumatra, Java-Bali, Kalimantan, Sulawesi and Eastern Indonesia. It was found that the between-region inequality was insignificant by constituting merely 1% of overall inequality. It should be noted that Akita (2003) and Akita and Alisjahbana (2002) conducted a hierarchical inequality decomposition analysis using the Theil indices. However, these studies were based on district-level GDP data and assessed the contributions of inter-regional and inter-provincial inequalities to inequality among districts in per capita GDP.

3. Method and the Data

3.1. Method: Hierarchical Decomposition of Expenditure Inequality by the Theil

Index L

⁴ We should note that according to an alternative approach introduced by Elbers and others (2008), the disparity between urban and rural areas becomes more significant, where the disparity is assessed against the maximum between-group inequality attainable given the number and relative sizes of the groups rather than overall inequality that is used in the conventional approach (Hayashi, Kataoka and Akita, 2014).

To investigate patterns of spatial inequality, we perform hierarchical inequality decomposition analyses based on household expenditure data. The analyses are done using the Theil index L (i.e., mean logarithmic deviation) in two hierarchical spatial frameworks.⁵ The Theil index L belongs to the generalized entropy class of measures and satisfies several desirable properties, such as anonymity, population homogeneity, income homogeneity and the Pigue-Dalton principle (Anand, 1983). It is also additively decomposable by population sub-groups (Bourguignon, 1979; Shorrocks, 1980). The Theil index L has 0 when all households have the same per capita expenditure and increases as the distribution of per capita expenditures becomes more unequal.

3.1.1. Hierarchical Inequality Decomposition Analysis: Sector-District Framework

Consider a population of N households. In a hierarchical decomposition analysis in the sector (urban and rural)-district framework, all households are first classified into the urban and rural sectors (sectors 1 and 2, respectively), where there are, respectively, N_1 and N_2 households. Households in each of the urban and rural sectors are then classified into districts (*kabupatens and kotas*) according to their residential locations, where there are, respectively, m_1 and m_2 districts. We should note that m_1 is not equal to m_2 , since in some districts there are no rural households (e.g., districts in Jakarta) and in some other districts there are no urban households.

In order to obtain the hierarchical inequality decomposition equation, we let y_{sdh} and Y denote, respectively, the per capita expenditure of household h in district d in sector s and the total per capita expenditure of all households. Overall inequality in per capita expenditure (hereafter, referred to as expenditure inequality) is then measured by the Theil index L as follows:

⁵ Decomposition analyses are conducted also using the Theil index T . But the results are very similar to the ones by the Theil index L qualitatively, thus only the Theil L results are presented and discussed in this paper.

$$L = \sum_s \sum_d \sum_h \left(\frac{1}{N} \right) \log \left(\frac{1/N}{y_{sdh}/Y} \right) \quad (1)$$

Overall inequality can be decomposed hierarchically into the between-sector inequality component (L_{BS}), the within-sector between-district inequality component (L_{WSBD}), and the within-sector within-district inequality component (L_{WSWD}) as follows:

$$\begin{aligned} L &= L_{BS} + \sum_s \left(\frac{N_s}{N} \right) L_s \\ &= L_{BS} + \sum_s \left(\frac{N_s}{N} \right) L_{BDs} + \sum_s \sum_d \left(\frac{N_{sd}}{N} \right) L_{sd} \\ &= L_{BS} + L_{WSBD} + L_{WSWD}. \end{aligned} \quad (2)$$

where N_{sd} , L_s , L_{BDs} and L_{sd} are, respectively, the number of households in district d in sector s , inequality within sector s , inequality among districts in sector s and inequality within district d in sector s .

In this decomposition framework, the order of decomposition can be reversed, i.e., overall inequality can be decomposed into the between-district component (L_{BD}), the within-district between-sector component (L_{WDBS}), and the within-district within-sector component (L_{WDWS}) as follows

$$\begin{aligned} L &= L_{BD} + \sum_d \left(\frac{N_d}{N} \right) L_d \\ &= L_{BD} + \sum_d \left(\frac{N_d}{N} \right) L_{BSd} + \sum_d \sum_s \left(\frac{N_{ds}}{N} \right) L_{ds} \\ &= L_{BD} + L_{WDBS} + L_{WDWS}. \end{aligned} \quad (3)$$

where N_d , L_d , L_{BSd} and L_{ds} are, respectively, the number of households in district d , inequality within district d , inequality between sectors in district d and inequality within

sector s in district d .

In connection with this multivariate decomposition method, Tang and Petrie (2009) suggested an alternative decomposition framework, called the non-hierarchical decomposition method, which is given by:

$$L = L_{BS} + L_{BD} + L_{ISD} + L_{WSWD} \quad (4)$$

where L_{ISD} is the sector-district interaction term. Since $L_{WSBD} = L_{BD} + L_{ISD}$ from equations (2) and (4), the interaction term is given by $L_{ISD} = L_{WSBD} - L_{BD}$, which could be negative if expenditure inequality among districts is due in part to the disparity between the urban and rural sectors. This method is, however, unable to examine the difference between the urban and rural sectors in the magnitude of inequality among districts.

3.1.2. Hierarchical Inequality Decomposition Analysis: Region-Province-District Framework

Indonesia can be divided into the following five regions: Sumatra, Java-Bali, Kalimantan, Sulawesi and Eastern Indonesia. In a hierarchical decomposition analysis in the region-province-district framework, households in each of these five regions are grouped hierarchically into provinces and then districts (*kabupatens and kotas*) according to their residential locations. In contrast to the sector-district decomposition framework, there is a natural hierarchical order, i.e., each region includes a distinct set of provinces and each province contains a distinct set of districts and thus the order of decomposition cannot be reversed. Since there are differences in expenditure inequality between the urban and rural sectors, we perform this hierarchical decomposition analysis for the urban and rural sectors separately.⁶

⁶ Urban inequality is usually higher than rural inequality since the urban sector offers a much wider variety of jobs than the rural sector (see Eastwood and Lipton, 2004).

We let y_{rpdh} denotes the per capita expenditure of household h in district d in province p of region r . Overall expenditure inequality is then measured by the Theil index L as follows:

$$L = \sum_r \sum_p \sum_d \sum_h \left(\frac{1}{N} \right) \log \left(\frac{1/N}{y_{rpdh}/Y} \right) \quad (5)$$

Overall inequality can then be decomposed hierarchically into the four inequality components: the between-region (L_{BR}), between-province (L_{BP}), between-district (L_{BD}) and within-district (L_{WD}) components as follows (for details, see Akita, 2003 and Paredes, Iturra and Marcelo, 2016):

$$L = L_{BR} + L_{BP} + L_{BD} + L_{WD}. \quad (6)$$

It should be noted that the between-province (L_{BP}) and between-district (L_{BD}) components should be called, more precisely, the within-region between-province and within-province between-district components, respectively. But, for simplicity, the terms ‘the between-province and between-district components’ are used hereafter.

3.2. The Data

This study employs monthly household expenditure data from *Susenas* compiled by the Central Bureau of Statistics (CBS).⁷ Since 2011, *Susenas* has been conducted quarterly; therefore, our study does not include data from 2011 onward to avoid the comparability problem. *Susenas* has covered the whole country, but the province of Aceh is excluded from our data set due to missing data in some years.⁸ When Aceh is excluded, *Susenas* had

⁷ Based on *Susenas*, Table A1 in the appendix presents mean per capita expenditure by province (as % of Indonesia’s mean per capita expenditure). It also shows the distribution of population across provinces in 2000 and 2010 (in %).

⁸ *Susenas* was not conducted in Aceh due to political and security reasons for some years.

194,997 households in 1996. The sample size has increased since then, and in 2010, *Susenas* included 282,321 households, of which 126,785 and 155,536 are, respectively, in urban and rural areas. According to the estimated number of households obtained using household sampling weights, the urban sector constituted 36% of all households in 1996, but its share has risen prominently and in 2010 reached 50%. On the other hand, the shares of the five regions, i.e., Sumatra, Java-Bali, Kalimantan, Sulawesi and Eastern Indonesia, have remained almost constant; Java-Bali has the largest share at 63-65%, followed by Sumatra (17-19%), Sulawesi (6-7%), Eastern Indonesia (5-6%) and Kalimantan (5-6%).

Before 1999, Indonesia had 26 provinces including Aceh, but the number of provinces has increased gradually since the two decentralization laws were promulgated in 1999. In 1999, North Maluku was established by splitting Maluku. Subsequently in 2000, Bangka-Belitung Islands, Banten and Gorontalo were created, respectively, by splitting South Sumatra, West Java and North Sulawesi. Furthermore, between 2002 and 2004, Riau Islands, West Papua and West Sulawesi were established by partitioning Riau, Papua and South Sulawesi, respectively.⁹ Finally, in 2012, North Kalimantan was established by splitting East Kalimantan. As a result, Indonesia has now 34 provinces. In this study, these new provinces are merged back into the provinces that they used to belong to, thus a hierarchical inequality decomposition analysis based on equation (6) is performed with 25 provinces excluding Aceh.

When Aceh is excluded, *Susenas* provided expenditure data for 283 districts (*kabupatens and kotas*) before 1999. However, the number of districts has risen significantly under decentralization. In 2010, there were 474 in the dataset (see Figure 2).¹⁰ Before 1999, Java-Bali had the largest number of districts at 116, which was followed by

⁹ Papua was formerly called Irian Jaya.

¹⁰ In 2000 and 2002, the number of districts in the *Susenas* dataset fell slightly from the preceding year; but this is due mainly to missing observations for some districts in Maluku, North Maluku and Papua.

Sumatra, Sulawesi, Eastern Indonesia, and Kalimantan, respectively, at 63, 40, 35, and 29 districts. Between 1999 and 2010, 191 districts have been newly established; but much of the increase has occurred in non-Java-Bali regions. Particularly, in Sumatra and Eastern Indonesia, the number of districts has increased substantially, and in 2010, Sumatra had the largest at 128, which was followed by Java-Bali, Eastern Indonesia, Sulawesi and Kalimantan, respectively, at 127, 91, 73 and 55 districts.¹¹ We should note that only 11 new districts have been established in Java-Bali, while the other 4 regions have created 180 in total.¹² This suggests that the decentralization has had much larger effects on non-Java-Bali regions with respect to the establishment of new districts.¹³

In this study, newly established districts are not merged back into the districts from which they were separated. Therefore, some care should be taken in interpreting the result for the between-district inequality component. The between-district inequality component rises monotonically with the number of districts if new districts are created by dividing existing districts. However, the increment is getting smaller and smaller as the number of districts increases. Since the total number of districts is quite large at 300-500 after 2001, the effect of the increase on the between-district component is very small. This is exemplified in the next section when the between-district inequality for 2005 is re-estimated after merging the newly established districts into the districts that existed in the pre-decentralization period before 2001. Since the change in the between-district component is very small after merging the newly established districts, our results in the next section are robust.

¹¹ In Eastern Indonesia, much of the increase had occurred in Papua.

¹² According to Firman (2009, 2013), actually 164 *kabupatens* and 34 *kotas* had been newly established between 1999 and 2009 including Aceh, while general allocation funds (DAU) for districts had increased by 12% per year between 2001 and 2009. He argued that territorial splits have not only reinforced spatial fragmentation and local selfishness but also exerted an additional burden on the national budget.

¹³ Based on a district-level dataset for 1998-2004, Fitriani, Hofman and Kaise (2005) found that new districts are mostly concentrated in off-Java provinces and typically those with low population densities and limited formal human capital.

4. Empirical Results¹⁴

4.1. Hierarchical Inequality Decomposition Analysis: Sector-District Framework

Figure 3 shows the evolution of expenditure inequalities from 1996-2010 (for details, see Table 1). Like most other Asian countries, rural inequality has been much smaller than urban inequality (Eastwood and Lipton, 2004); but except for a few years, its rising and declining trends have been very similar to those of urban inequality. Urbanization has proceeded very rapidly. Due mainly to this rising urbanization and relatively high urban inequality, the levels and trends of overall inequality resemble very closely those of urban inequality. Though much smaller in magnitude, the disparity between the urban and rural sectors (i.e., the between-sector inequality) has a similar trend pattern to overall inequality, and its contribution to overall inequality has been around 15-25%.¹⁵ As shown in Table 1, a large difference exists between the urban and rural sectors in the magnitude of inequality among districts (B-district (BD) in Table 1). According to the result of the hierarchical decomposition analysis in the sector (urban and rural)-district framework, as shown in Figure 4 and Table 2, inequality among districts after controlling for the urban and rural difference (W-sector B-district (WSBD)) accounts for 15-25% of overall inequality.

Before the two decentralization laws were implemented, overall expenditure inequality showed a declining trend. However, after reaching the bottom in 2000 at 0.17, it started to rise and attained the peak in 2005 at 0.25. After it decreased to 0.17 in 2007, it started to increase again. We should note that based on standard errors estimated by

¹⁴ This section presents the results by the Theil index *L*. As mentioned in footnote 5, we also conducted decomposition analyses using the Theil index *T*. But, their results are very similar to the ones by the Theil *L* qualitatively and statistically. We should note that the contribution of the between-group component tends to be smaller by the Theil *T* than the Theil *L*. The Theil index *T* results can be obtained upon request.

¹⁵ According to the alternative approach developed by Elbers and others (2008), the contribution of the urban-rural disparity increases from 18.9% to 30.0% in 2010.

bootstrapping, the changes in expenditure inequality are all statistically significant. According to the result of the hierarchical decomposition analysis in the sector-district framework, the main determinant of the decline in overall expenditure inequality until 2000 appears to have been the decrease in the urban-rural expenditure disparity (B-sector (BS) in Tables 1 and 2). Its contribution amounted to more than 40% of the decline. We should note that this period included the 1997/98 financial crisis. As pointed out by Akita and Alisjahbana (2002), the financial crisis appears to have narrowed the disparity between the urban and rural sectors, particularly between major urban areas and other areas in Sumatra and Java-Bali. This is because the effect of the crisis was borne disproportionately by these major urban areas due to their high reliance on the financial, non-oil and gas manufacturing and construction sectors, which were hit hardest by the crisis.

On the other hand, the main determinant of the rise in overall expenditure inequality between 2000 and 2005 seems to have been the increase in the between-district inequality component in both the urban and rural sectors (B-district (BD) in Table 1) in addition to the rise in the urban-rural disparity (B-sector (BS) in Table 1). Since the two decentralization laws were implemented in 2001, the number of districts has increased conspicuously, particularly in non-Java-Bali regions (see Figure 2): while Java-Bali has increased its districts from 117 to 124 between 2000 and 2005, the other four regions have increased their districts notably from 167 to 283. This might have raised, to some extent, the between-district inequality component. In order to examine its effects, we re-estimated the between-district inequality for 2005 after the newly established districts are merged back into the districts that existed in the pre-decentralization period. Estimated between-district inequality values for the urban and rural sectors are, respectively, 0.074 and 0.028, which are compared to 0.075 and 0.030 in Table 1. As expected, the reductions are not large enough to alter our discussion on the factors of the inequality change.

While it is not possible to confirm the causal relationship in our study, one of the possible factors for the rise in inequality among districts would be fiscal decentralization, since the natural resources revenue sharing scheme under decentralization has made natural resource-abundant districts richer as compared to resource-poor districts.¹⁶ It should be noted that besides fiscal decentralization, rising domestic rice prices would be another factor of the rapid rise in overall inequality, particularly from 2004 to 2005, since the price increase would have exerted a more detrimental effect on the poor than the rich (McCulloch, 2008; Yusuf, Sumner and Rum, 2014). This is, in fact, indicated by the rise in the within-sector within-district inequality component (W-sector W-district (WSWD) in Table 2), since the hike in domestic rice prices is less likely to have spatial effects.

Overall expenditure inequality had declined substantially between 2005 and 2007. It seems that three inequality components, i.e., the between-sector, within-sector between-district and within-sector within district components, are equally responsible for the decrease, since their contributions to overall inequality have remained almost constant over the period (see B-sector (BS), W-sector B-sector (WSBD) and W-sector W-district (WSWD) in Table 2). This period corresponds to the period after the enactment of the two revised decentralization laws (i.e., Law 32/2004 and Law 33/2004).¹⁷ Though the effects of

¹⁶ Under the natural resources revenue sharing scheme introduced by Law 25/1999, regions (provinces and districts) receive 15 and 30% of oil and gas revenues, respectively and 80% of the revenue from other natural resources (i.e., forestry, fishery and general mining); with a few exceptions, of the amount allocated to the producing regions, 20% goes to the province, 40% goes to the producing districts, and the other 40% is shared equally among the non-producing districts in the province (Brodjonegoro and Asanuma, 2000; Brodjonegoro & Martinez-Vazquez, 2004; Bahl & Tumennasan, 2004). It should be noted that the special autonomous provinces of Aceh, West Papua and Papua receive much higher shares of their oil and gas revenues (Agustina, Schulze and Fengler, 2012). On the other hand, under the tax revenue sharing scheme introduced also by Law 25/1999, regions (provinces and districts) receive 20% of the revenue from personal income tax, while they receive 90% and 80%, respectively, of the revenues from property tax and tax on the transfers of land and building ownership (Brodjonegoro and Asanuma, 2000; Brodjonegoro & Martinez-Vazquez, 2004).

¹⁷ In 2004, the two revised decentralization laws, i.e., Law 32/2004 on Regional Government and Law 33/2004 on the Fiscal Balance between the Central Government and the Regions, were enacted and replaced Law 22/1999 and Law 25/1999, respectively. Under Law 32/2004, the roles of provincial governments were strengthened: provincial governors, who are now elected by popular vote, not only guide and supervise the governance of their district governments but also coordinate the implementation of central government affairs

Law 32/2004, which redesigned the intergovernmental governance framework and strengthened the roles of provincial governments, is uncertain and thus need to be examined with some other empirical methods, the law might have exerted some effects on the decline in expenditure inequality.¹⁸

In 2005, the government reduced fuel subsidies and more than doubled domestic fuel prices.¹⁹ The intention was not only to narrow the gap between domestic and international prices but also to reduce the burden on the national budget as fuel subsidies constituted a substantial portion of the budget (Mcleod, 2008; Agustina, Schulze and Fengler, 2012; Howes and Davies, 2014). At the same time, the government provided massive unconditional cash transfers to the poor (BLT) to compensate the damage caused by the domestic fuel price increase (Sumarto and Suryahadi, 2010).²⁰ While the gap between domestic and international fuel prices has still existed, this policy package seems to have mitigated expenditure inequality in both the urban and rural sectors between 2005 and 2007.

After 2007, overall inequality started to rise again. Unlike the previous periods, the within-sector within-district inequality component (W-sector W-district (WSWD) in Table 2) is mostly responsible for the rise, as it accounts for 80% of the increase. Its contribution to overall inequality has risen from 59 to 64%. Yusuf, Sumner and Rum (2014) argued that large fuel subsidies would have increased inequality, since their impact on expenditures is

in their provinces, while under Law 33/2004, which was fully implemented in 2008, the revenue shares of oil and gas producing regions (provinces and districts) have increased slightly to 15.5 and 30.5%, respectively, for oil and gas, and geothermal energy has been added in other natural resources (Soesastro and Atje, 2005).

¹⁸ Between 2005 and 2007, the share of general and special allocation grants (DAU and DAK) in the total district government budget has increased significantly from 59 to 67%, while the proportion of the shared revenues from natural resources and taxes (DBH) has declined from 24 to 17% (Lewis and Smoke, forthcoming). DAU is widely referred to as an equalization grant and thought to have inequality-reducing effects, as opposed to DBH (Lewis, 2001).

¹⁹ The government raised the price of premium gasoline from Rp 1,810 to 4,500 per liter. It also raised the price of kerosene from Rp 700 to 2,000 per liter.

²⁰ An unconditional cash transfer program, known as BLT (*Bantuan Langsung Tunai*), was launched in October 2005. The government allocated more than half of the savings generated by the fuel subsidy cut to this cash transfer program. The BLT program provided poor households (more than a quarter of all households) with Rp.300,000 per household every three months (Sumarto and Suryahadi, 2010).

known to have been regressive and thus they have had a dis-equalizing effect on household expenditures. They argued also that changes in formal labor market regulations, such as increasing minimum wages, rising retirement benefits, and the strengthening of labor unions, would have increased inequality, as the changes are likely to have benefited the rich disproportionately. Since these factors were less likely to have spatial effects, they might have some bearing on the increase in the within-sector within-district component.

Between 2007 and 2008, both rural and urban inequalities rose sharply and this rapid rise was found to be uniform across districts as most districts recorded an increase in their within-district inequalities in both sectors. This suggests that non-spatial factors are mainly responsible for the rise. In this period, the world oil price rose sharply from around \$60 per barrel to more than \$90 per barrel, and this was accompanied by a rapid increase in the CPI (Consumer Price Index) inflation rate, from 6% in the mid-2007 to more than 10% (McLeod, 2008). Meanwhile, domestic fuel prices have remained low owing to large fuel subsidies, and the gap between domestic and international fuel prices has been widening. This has made domestic fuels much less expensive than other commodities. Since the rich consume much more energy, this has benefitted the rich more than the poor. As mentioned above, the effect of fuel subsidies on expenditures has been regressive, particularly under the situation where the difference between domestic and international fuel prices is large. Large fuel subsidies in this period thus appear to have raised expenditure inequality substantially.

In October 2008, the government cut fuel subsidies again and raised fuel prices by 33% (Howes and Davies, 2014).²¹ At the same time, it introduced a social protection program, including unconditional cash transfers (BLT) and rice subsidies to the poor, to compensate for the domestic fuel price increase. This policy package would have lowered

²¹ The government increased premium gasoline from Rp. 4,500 to 6,000 per liter and kerosene from Rp. 2,000 to 2,500 per liter. However, this fuel price increase did not last owing to oil price decrease.

expenditure inequalities slightly between 2008 and 2009, particularly in the rural sector. However, a large gap has still existed between domestic and international fuel prices, and it is not until July 2013 that the government raised domestic fuel prices (Howes and Davies, 2014).

4.2. Hierarchical Inequality Decomposition Analysis in the Urban and Rural Sectors: Region-Province-District Framework

According to Table 2, which provides the result of a non-hierarchical decomposition analysis, the sector-district interaction term has a large negative value (see equation (4)). This indicates that expenditure inequality among districts is due in part to the expenditure disparity between the urban and rural sectors. Therefore, an inequality decomposition analysis needs to be conducted for each sector separately. In this section, we perform a hierarchical decomposition analysis in the region-province-district framework to investigate patterns of spatial inequalities for each sector (see equation (6)).

Figures 5-1 and 5-2 present the results in the rural and urban sectors, respectively. Several observations emerge from the analysis. While there were some fluctuations over the study period, around 25-30% of urban inequality and around 15-25% of rural inequality are explained by inequality among districts (i.e., the sum of the between-region, between-province and between-district inequality components).²² In other words, inequality among districts constitutes a significant portion of expenditure inequality in both the urban and rural sectors. However, the contribution of the disparity between the five regions (the between-region component) is very small. Particularly, in the urban sector, it is almost negligible as it amounts to merely 0-2% of urban inequality; among the five regions, the

²² As mentioned in the methodology section, the between-province and between-district inequality components refer, respectively, to the within-region between-province and within-province between-district components.

ratio of the largest to smallest mean per capita expenditure is only around 1.2-1.4. On the other hand, the disparity between the five regions constitutes 1-5% of rural inequality, and it appears to have been increasing.

The between-province and between-district inequality components have much larger contributions in both the urban and rural sectors. Their combined contribution is 25-30% to urban inequality and 10-20% to rural inequality. If a comparison is made between these two components, the between-district component has played a more important role in the rural sector. Its contribution amounts to 5-15% of rural inequality. In contrast, the between-province component had played a more important role in urban inequality, though this was until 2007 and the between-district component has overtaken the between-province component. We should note, however, that much of urban sector's between-province inequality component is due to inter-provincial inequality in Java-Bali, particularly the disparity between Jakarta and the other Java-Bali provinces, as Java-Bali's inter-provincial inequality accounts for more than 80% of the between-province component. Jakarta, the largest metropolitan area, has the largest mean per capita expenditure among 25 provinces; its mean per capita expenditure has been more than twice as large as the smallest in the Java-Bali region (see Table A1 in the appendix). If Jakarta and its adjacent province (West Java) were merged and treated as one province, Java-Bali would have a much smaller disparity between provinces, making the between-province inequality component smaller than the between-district component.

While spatial inequality constitutes a significant portion of expenditure inequality among households, the contribution of the within-district inequality component is much larger, amounting to 70-75% of urban inequality and 75-85% of rural inequality. Figures 6-1 and 6-2 present, respectively, frequency distributions of districts in the rural and urban sectors with respect to within-district inequality in 2010, where districts are classified into

the Western and Eastern regions. The Western region includes Sumatra and Java-Bali, while the Eastern region includes Kalimantan, Sulawesi and Eastern Indonesia.²³ The Eastern region has a higher mean within-district inequality than the Western region in both rural and urban areas. The Eastern region also has a larger variation than the Western region. In Eastern rural areas, most of high inequality districts (inequality above 0.20) are concentrated in Eastern Indonesia, particularly in the province of Papua, while in Eastern urban areas, 47 high inequality districts are scattered over Eastern provinces. On the other hand, more than 90% of Western rural districts have their inequalities smaller than 0.15 and only two Western rural districts are high inequality districts (inequality above 0.20). In Western urban areas, three quarters of the districts have inequality in the range of 0.10-0.20 and a half of high inequality districts are concentrated in Jakarta, West Java and Central Java.

Though it is not the task of our study to explore factors determining expenditure inequalities within urban and rural districts, education and occupation of household head appear to have been the main factors.²⁴ According to randomly selected urban and rural districts from the 2010 *Susenas* sample, educational and occupational differences constitute 20-30% of inequalities within urban and rural districts. However, there are large variations in the contributions of these factors among districts, due perhaps to social, economic and cultural differences.

5. Conclusions

This study analyzed spatial inequalities in Indonesia from 1996 to 2010 using the hierarchical decomposition method. Unlike most previous studies, it used household

²³ In the Western region, there are 221 and 254 districts in the rural and urban sectors, respectively. On the other hand, in the Eastern region, there are 217 and 197 districts.

²⁴ See Akita (2017) for the roles of education in expenditure inequality.

expenditure data rather than regional accounts data as the former is considered a better indicator of regional welfare levels. The following summarizes major findings. First, due mainly to rising urbanization and relatively high urban inequality, the levels and trends of overall expenditure inequality resemble very closely those of urban inequality. Urban-rural disparity has a similar trend pattern, and its contribution to overall inequality is around 15-25%. Second, a large difference exists between urban and rural areas in the magnitude of inequality among districts (*kabupatens* and *kotas*). After controlling for the urban-rural difference, the inequality accounts for 15-25% of overall inequality.

Third, the main determinant of the decline in overall inequality until 2000 appears to have been the decrease in the urban-rural disparity. The 1997/98 financial crisis seems to have narrowed the disparity. Fourth, rising overall inequality from 2000-2005 seems to have been due to the increase in inequality among districts. One of the possible factors would be fiscal decentralization, since the natural resources revenue sharing scheme has made natural resource-abundant districts richer. Fifth, all inequality components seem to be equally responsible for the decrease in overall inequality from 2005-2007. A drastic reduction of fuel subsidies in 2005 accompanied by a compensation package might have reduced expenditure inequality. Sixth, the non-spatial component is mostly responsible for the rise in overall inequality from 2007-2010. Among others, changes in formal labor market regulations would have increased inequality as the changes are likely to have benefited the rich disproportionately more than the poor. Low domestic fuel prices owing to sustained large fuel subsidies are also likely to have raised inequality since they have benefitted the rich who consume much more energy. While a cut in fuel subsidies accompanied by a compensation package in 2008 would have lowered inequality slightly, the increasing trend seems to have persisted. Finally, inequality among districts constitutes a significant portion of expenditure inequality in both urban and rural areas. However,

disparity between five major island regions is almost negligible. Meanwhile, inequalities between districts within provinces seem to have been playing an increasingly important role in both urban and rural areas.

In order to mitigate spatial inequalities and to cope with periodic secessionist movements, the government embarked on a 'Big-Bang' decentralization. However, the effects of the decentralization remain uncertain, and large inequalities still exist between provinces and districts. According to district-level data from *Susen*, the ratio of the largest to smallest mean per capita expenditure was 6.8 in 2010, compared to 6.3 in 1996. Akita, Kurniawan and Miyata (2011) suggested three major factors of spatial inequalities in Indonesia. The first is the uneven spatial distribution of immobile natural resources. Though this has become less prominent due to the declining role of mining activities in the national economy, the resource rich provinces of Riau, East Kalimantan and West Papua still have relatively high mean per capita expenditure.

The second is the primacy of Jakarta and its adjacent districts, i.e., Bogor, Depok, Tangerang and Bekasi (usually abbreviated as Jabodetabek). Under globalization and economic liberalization, Jabodetabek has nurtured agglomeration economies as the center of politics and economy. Its mean per capita expenditure is more than twice as large as the national average. As pointed out by Hill, Resosudarmo and Vidyattama (2008), the regions that have easier access to the global economy, such as Jabodetabek, appear to have performed much better than those that have poor access. The third factor is the uneven spatial distribution of resource-based manufacturing industries such as wood processing and plantation- and mineral-based industries in Sumatra, Kalimantan and Eastern Indonesia, as these industries tend to be located closer to where raw materials are available.

Given uneven spatial distributions of resource endowments, public infrastructure and economic activities, some spatial inequalities are inevitable from the point of view of

efficiency. Nevertheless, sustained efforts are necessary to reduce spatial inequalities to facilitate national unity, cohesion and stability. In a geographically and culturally diverse archipelagic country where natural resources and economic activities are unevenly distributed, the government needs to accelerate infrastructure development, particularly development of transportation networks.

Indonesia is facing a major infrastructure deficit (Ray and Ing, 2016). In the road transport sector, the number of motor vehicles increased conspicuously by 12% per year between 1970 and 2013 owing to rapid motorization, while the total length of roads grew by only 4% per year (McCawley, 2015). Furthermore, due to poor construction quality, overloading and poor maintenance, roads tend to have short asset lives (Ray and Ing 2016). In the rail transport sector, on the other hand, the total number of passengers grew by 3.5% per year between 1970 and 2013, but Java accommodates much of the railway system and many of its main railway lines remain single-track (McCawley, 2015). Poor transport connectivity would not only weaken the competitiveness of the national economy but also facilitate disparities among regions. Recently, infrastructure policy is a major concern among economic policy makers in Indonesia. Fortunately, in 2015, the world oil price has declined notably, from above \$100 to less than \$50 per barrel; this enables the government to shift its budget from fuel subsidies to infrastructure spending.²⁵ Given the limited amounts of financial resources, however, coordinated efforts are imperative among public and private sectors based on a strategic long-term plan to promote infrastructure development.

This study is not without limitations. First, this study employed nominal expenditure data from *Susenas*. It is preferable that nominal expenditures are adjusted for regional price differentials to examine real disparities across spatial units. According to Hayashi, Kataoka

²⁵ The oil price is currently somewhere around \$50-55 per barrel.

and Akita, however, which employed price adjusted expenditure data for 2008-2010, the contribution of urban-rural disparity to overall expenditure inequality is somewhere around 14% for 2008-2010 by the Theil index T , which is very similar to the one by the Theil T for the same period in our study. They also estimated the contribution of the disparity between 5 major regions, which is very small at around 1%. This contribution is also very similar to the one in our study. Nonetheless, it is one of our future studies to estimate spatial inequalities using price adjusted expenditure data. Second, it is not possible for our study to analyze the causal relationship between decentralization and spatial inequalities. A further empirical research, perhaps using regional panel data, is necessary to explore the causal relationship. Third, our study did not include the period after 2010. According to Yusuf, Sumner and Rum (2014) and Yusuf and Sumner (2015), expenditure inequality has increased further, and in 2013, the Gini coefficient has risen to 0.41, from 0.33 in 2001. This is an alarming level considering the fact that inequality is measured by expenditure rather than income data. Although the Gini coefficient has stabilized at around 0.41 between 2013 and 2015 due perhaps to the end of the commodity boom (Yusuf and Sumner, 2015), it is still very high by international standards. It is thus interesting to examine spatial inequalities after 2010.

References

- Agustina, Cut Dian R.D., Schulze, G. G., & Fengler, W. (2012). The regional effects of Indonesia's oil and gas policy: options for reform. *Bulletin of Indonesian Economic Studies*, 48(3), 369-397.
- Akita, T. (1988). Regional development and income disparities in Indonesia. *Asian Economic Journal*, 2, 165-91.
- Akita, T. (2003). Decomposing regional income inequality in China and Indonesia using two-stage nested Theil decomposition method. *The Annals of Regional Science*, 37(1), 55-77.
- Akita, T. (2017). Educational expansion and the role of education in expenditure inequality in Indonesia since the 1997 financial crisis. *Social Indicators Research*, 130, 1165-1186.

- Akita, T., & Alisjahbana, A. (2002). Regional income inequality in Indonesia and the initial impact of the economic crisis. *Bulletin of Indonesian Economic Studies*, 38, 201-22.
- Akita, T., & Lukman, R.A. (1995). Interregional inequalities in Indonesia: A sectoral decomposition analysis for 1975-92. *Bulletin of Indonesian Economic Studies*, 31, 61-81.
- Akita, T., & Lukman, R.A. (1999). Spatial patterns of expenditure inequalities in Indonesia: 1987, 1990, and 1993. *Bulletin of Indonesian Economic Studies*, 35, 65-88.
- Akita, T., & Miyata, S. (2008). Urbanization, educational expansion, and expenditure inequality in Indonesia in 1996, 1999, and 2002. *Journal of the Asia Pacific Economy*, 13, 147-67.
- Akita, T., & Miyata, S. (2010). The bi-dimensional decomposition of regional inequality based on the weighted coefficient of variation. *Letters in Spatial and Resource Sciences*, 3(3), 91-100.
- Akita, T., & Miyata, S. (2013). The roles of location and education in the distribution of economic wellbeing in Indonesia: Hierarchical and non-hierarchical decomposition analyses. *Letters in Spatial and Resource Sciences*, 6(3), 137-150.
- Akita, T., Kurniawan, P. A., & Miyata, S. (2011). Structural changes and regional income inequality in Indonesia: A bi-dimensional decomposition analysis. *Asian Economic Journal*, 25(1), 55-77.
- Alm, J., Aten, R.H. & Bahl, R. (2001). Can Indonesia decentralize successfully? plans, problems and prospects. *Bulletin of Indonesian Economic Studies*, 37(1), 83-102.
- Anand, S. (1983), *Inequality and Poverty in Malaysia: Measurement and Decomposition*. New York: Oxford University Press.
- Bahl, R., & Tumennasan, B. (2004). How should revenues from natural resources be shared in Indonesia? In *Reforming Intergovernmental Fiscal Relations and the Rebuilding of Indonesia*. (Eds.) J. Alm, J. Martinez-Vazquez, Sri Mulyani Indrawati, Cheltenham: Edward Elgar, 199-233.
- Barro, R. J., & Sala-i-Martin, X. I. (1992) Convergence. *Journal of Political Economy*, 100(2), 223-251.
- Barro, R. J., & Sala-i-Martin, X. I. (1995) *Economic Growth*, New York: McGraw Hill.
- Bourguignon, F. (1979). Decomposable income inequality measures. *Econometrica*, 47(4), 901-20.
- Brodjonegoro, B. & Asanuma, S. (2000). Regional autonomy and fiscal decentralization in democratic Indonesia. *Hitotsubashi Journal of Economics*, 41, 111-122.
- Brodjonegoro, B. & Martinez-Vazquez, J. (2004). An analysis of Indonesia's transfer system: recent performance and future prospects. In *Reforming Intergovernmental Fiscal Relations and the Rebuilding of Indonesia*. (Eds.) J. Alm, J. Martinez-Vazquez, Sri Mulyani Indrawati, Cheltenham: Edward Elgar, 159-198.
- Chongvilaivan, A. & Kim, J. (2016). Individual income inequality and its drivers in Indonesia: A Theil decomposition reassessment. *Social Indicators Research*, 126, 79-98.

- Eastwood, R., & Lipton, M. (2004). Rural and urban income inequality and poverty: Does convergence between sectors offset divergence within them?. In *Inequality, Growth, and Poverty in an Era of Liberalization and Globalization*, (Ed.) G. A. Cornia. Oxford: Oxford University Press, 112-141.
- Elbers, C., Lanjouw, P., Mistiaen, J. A., & Ozler, B. (2008). Reinterpreting between-group inequality. *Journal of Economic Inequality*, 6(3), 231–45.
- Esmara, H. (1975). Regional income disparities. *Bulletin of Indonesian Economic Studies*, 11, 41-57.
- Firman, T. (2009). Decentralization reform and local–government proliferation in Indonesia. *Review of Urban and Regional Development Studies*, 21(2/3), 143–157.
- Firman, T. (2013). Territorial splits (*Pemekaran Daerah*) in decentralizing Indonesia, 2000-2012: local development drivers or hindrance? *Space and Polity*, 17(2), 180-196.
- Fitrani, F., Hofman, B. & Kaiser, K. (2005). Unity in diversity? The creation of new local governments in a decentralizing Indonesia. *Bulletin of Indonesian Economic Studies*, 41(1), 57–79.
- Garcia, J.G., & Soelistianingsih, L. (1998). Why do differences in provincial incomes persists in Indonesia? *Bulletin of Indonesian Economic Studies*, 34, 95-120.
- Hayashi, M., Kataoka, M., & Akita, T. (2014). Expenditure inequality in Indonesia, 2008-2010: A spatial decomposition analysis and the role of education. *Asian Economic Journal*, 28(4), 389-411.
- Hill, H. (1992). Regional development in a boom and bust petroleum economy: Indonesia since 1970. *Economic Development and Cultural Change*, 40, 351-80.
- Hill, H. (2008). Globalization, inequality, and local-level dynamics: Indonesia and the Philippines. *Asian Economic Policy Review*, 3, 2–61.
- Hill, H., Resosudarmo, B.P., & Vidyattama, Y. (2008). Indonesia’s changing economic geography. *Bulletin of Indonesian Economic Studies*, 44, 407-35.
- Hill, H., & Vidyattama, Y. (2014). Hares and tortoises: regional development dynamics in Indonesia. In *Regional Dynamics in a Decentralized Indonesia* (Eds.) H. Hill, Singapore: Institute of South East Asian Studies, 68-97.
- Howes, S., & Davies, R. (2014). Survey of recent development. *Bulletin of Indonesian Economic Studies*, 50(2), 157-183.
- Kanbur, R., & Venables, A.J. (2005). Spatial inequality and development. In *Spatial Inequality and Development* (Eds.) R. Kanbur, A.J. Venables, New York: Oxford University Press, 3-11.
- Lewis, B. D. (2001). The new Indonesian equalization transfer. *Bulletin of Indonesian Economic Studies*, 37(3), 325-343.
- Lewis, B. D., & Smoke, P. (forthcoming). Intergovernmental fiscal transfers and local incentives and responses: The case of Indonesia. *Fiscal Studies*.
- McCawley, P. (2015). Infrastructure policy in Indonesia, 1965-2015: a survey. *Bulletin of Indonesian Economic Studies*, 51(2), 263-285.
- Mcleod, R. H. (2008). Survey of Recent Developments. *Bulletin of Indonesian Economic Studies*, 44(2), 183-208.

- Milanovic, B. (2005). Half a world: regional inequality in five great federations. *Journal of the Asia and Pacific Economy*, 10, 408-45.
- McCulloch, N. (2008). Rice prices and poverty in Indonesia. *Bulletin of Indonesian Economic Studies*, 44(1), 45-63.
- Oates, W. E. (1999). An essay on fiscal federalism. *Journal of Economic Literatures*, 37, 1120-1149.
- Paredes, D., Iturra, V., & Lufin, M. (2016). A spatial decomposition of income inequality in Chili. *Regional Studies*, 50(5), 771-789.
- Ray, D. & Ing, L. Y. (2016). Survey of recent developments: Addressing Indonesia's infrastructure deficit. *Bulletin of Indonesian Economic Studies*, 52(1), 1-25.
- Resosudarmo, B.P., & Vidyattama, Y. (2006). Regional income disparity in Indonesia: A panel data analysis. *ASEAN Economic Bulletin*, 23, 31-44.
- Shankar, R., & Shah, A. (2003). Bridging the economic divide within countries: A scorecard on the performance of regional policies in reducing regional income disparities. *World Development*, 31(8), 1421-1441.
- Shorrocks, A. (1980). The class of additively decomposable inequality measures. *Econometrica*, 48(3), 613-25.
- Shorrocks, A., & Wan, G. (2005). Spatial decomposition of inequality. *Journal of Economic Geography*. 5(1), 59-81.
- Silver, C., Azis, I. J. & Schroeder, L. (2001). Intergovernmental transfers and decentralization in Indonesia. *Bulletin of Indonesian Economic Studies*, 37(3): 345-62.
- Skoufias, E. (2001). Changes in regional inequality and social welfare in Indonesia from 1996 to 1999. *Journal of International Development*, 13, 73-91.
- Soesastro, H., & Atje, R. (2005), Survey of recent developments. *Bulletin of Indonesian Economic Studies*, 41(1): 5-34.
- Sumarto, S., & Suryahadi, A. (2010). Post-crisis social protection programs in Indonesia. In *Poverty and Social Protection in Indonesia* (Eds.) J. Hardjono, N. Akhmadi, & S. Sumarto, Singapore: Institute of Southeast Asian Studies, 218-233.
- Tadjoeddin, M. Z., Suharyo, W. I., & Mishra, S. (2001). Regional disparity and vertical conflict in Indonesia. *Journal of the Asia Pacific Economy*, 6(3), 283-304.
- Uppal, J.S., & Budiono, S. H. (1986). Regional income disparities in Indonesia. *Ekonomi dan Keuangan Indonesia*, 34, 286-304.
- Vidyattama, Y. (2010). A search for Indonesia's regional growth determinants. *ASEAN Economic Bulletin*, 27(3), 281-294
- Vidyattama, Y. (2013). Regional convergence and the role of the neighborhood effect in decentralised Indonesia. *Bulletin of Indonesian Economic Studies*, 49(2), 193-211
- Williamson, J. G. (1965). Regional inequality and the process of national development: A description of the patterns. *Economic Development and Cultural Change*, 13, 3-45.
- World Bank (2003). Decentralizing Indonesia: a regional public expenditure overview report, Report No. 26191-IND, World Bank East Asia Poverty Reduction and Economic Management Unit, Washington DC.

- Yusuf, A. A., Sumner, A., & Rum, I. A. (2014). Twenty years of expenditure inequality in Indonesia, 1993-2013. *Bulletin of Indonesian Economic Studies*, 50(2), 243-254.
- Yusuf, A. A., & Sumner, A. (2015). Survey of recent developments: growth, poverty, and inequality under Jokowi. *Bulletin of Indonesian Economic Studies*, 51(3), 323-348.

Figure 1. Hierarchical Spatial Structure

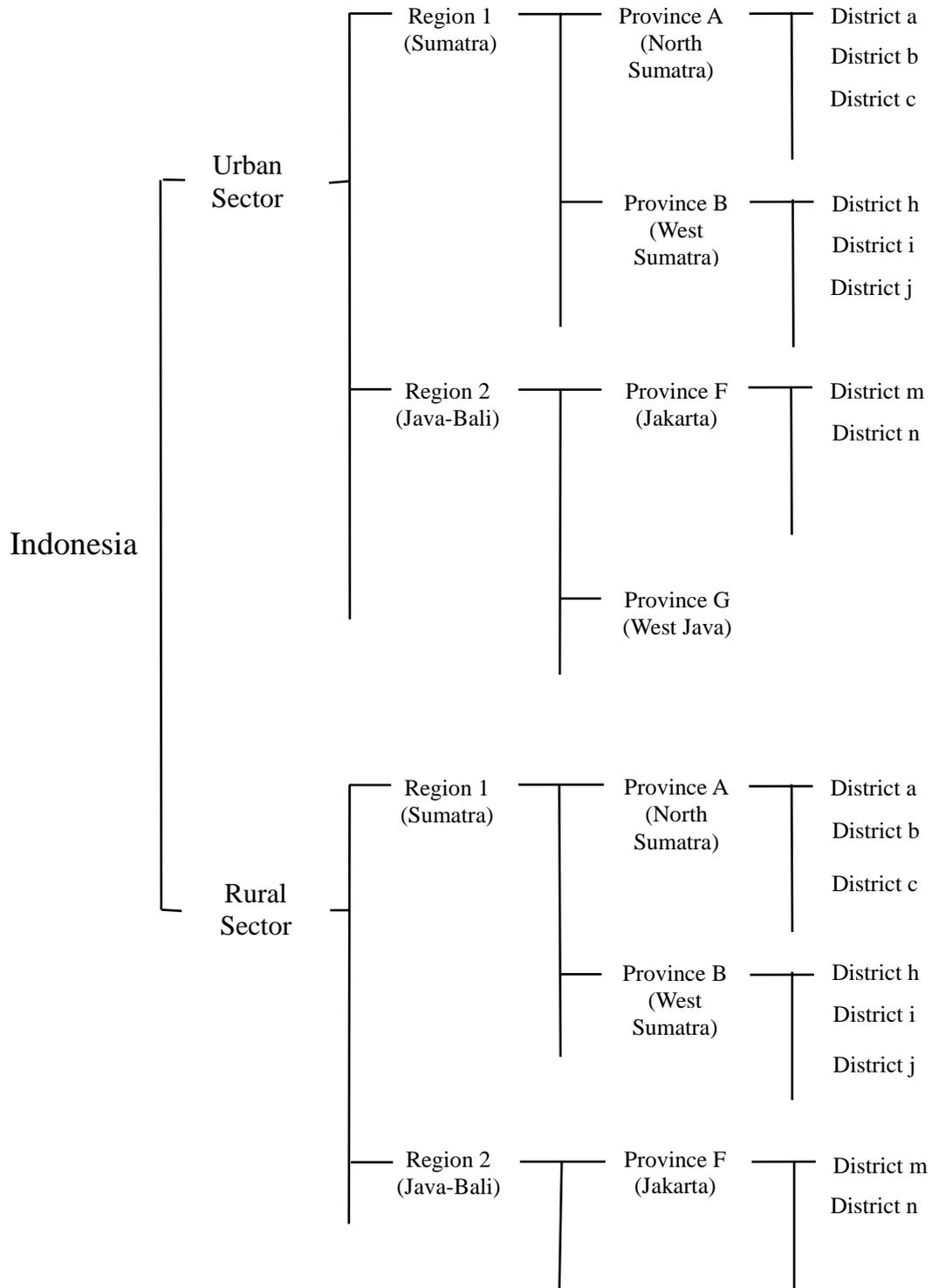


Figure 2. Number of Districts by Region

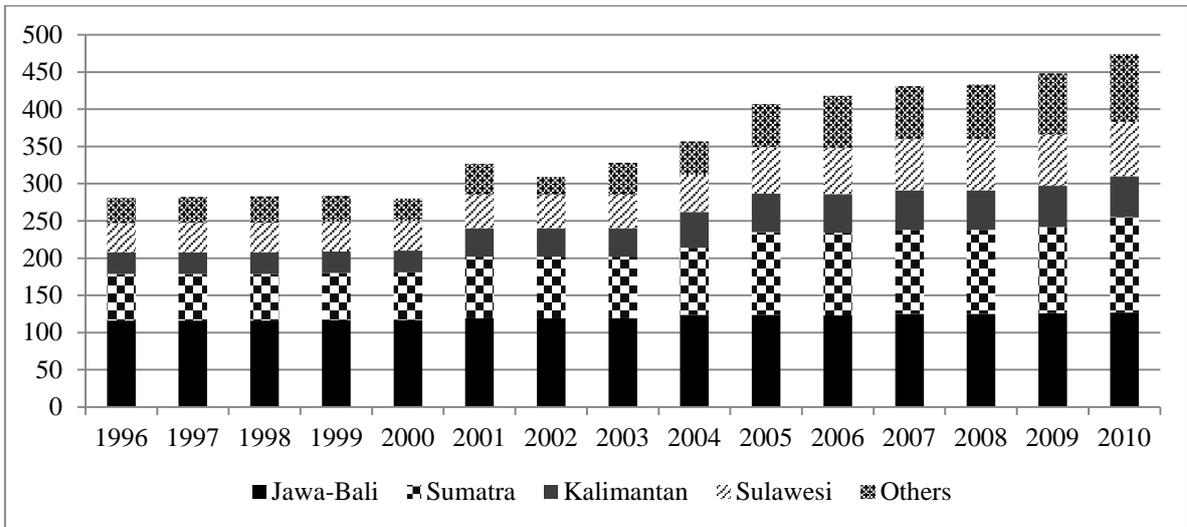


Figure 3. Expenditure Inequalities by Theil Index L

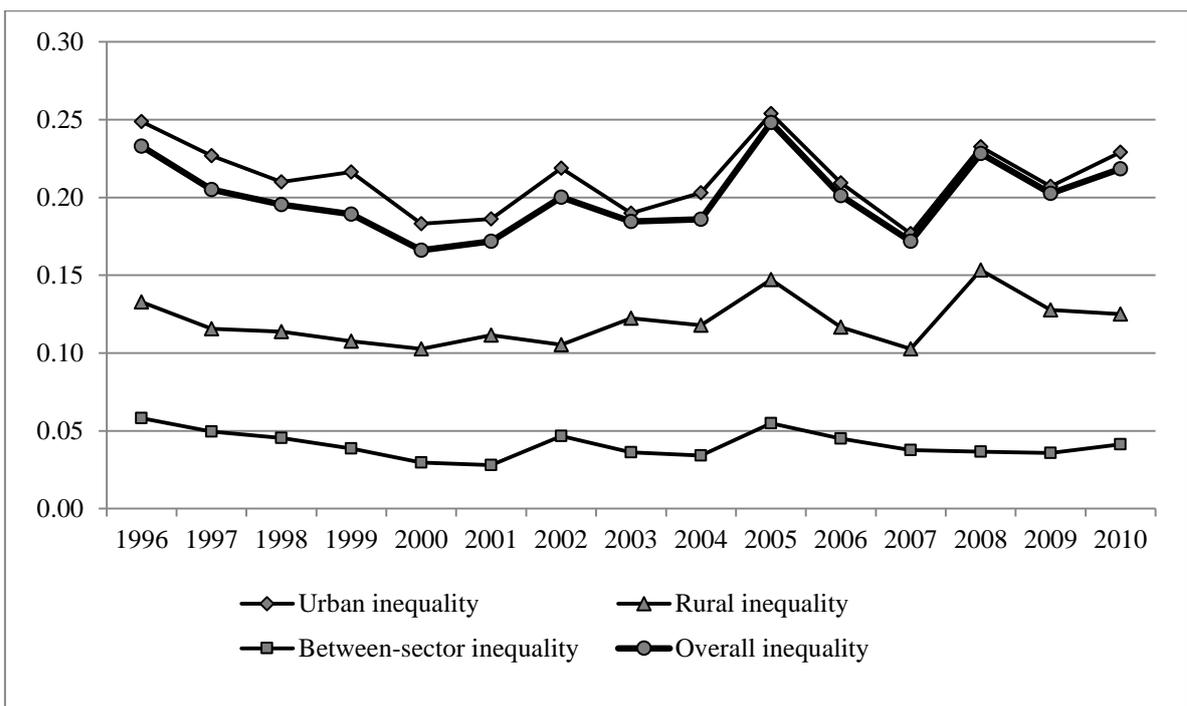


Figure 4. Hierarchical Decomposition of Overall Expenditure Inequality: Urban and Rural Sector-District, Theil Index L

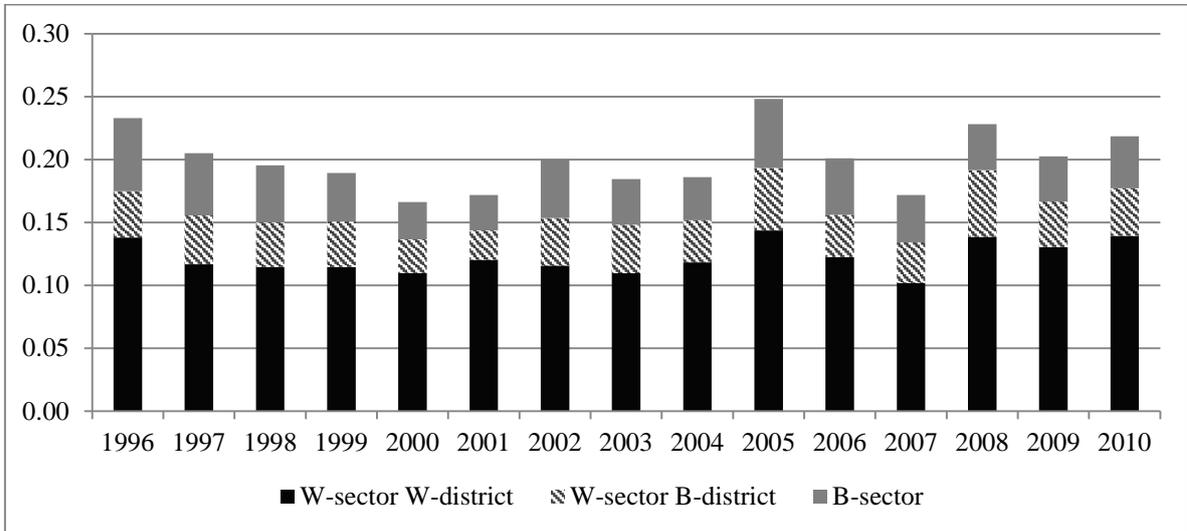


Figure 5-1. Hierarchical Decomposition of Rural Expenditure Inequality: Region-Province-District, Theil Index L

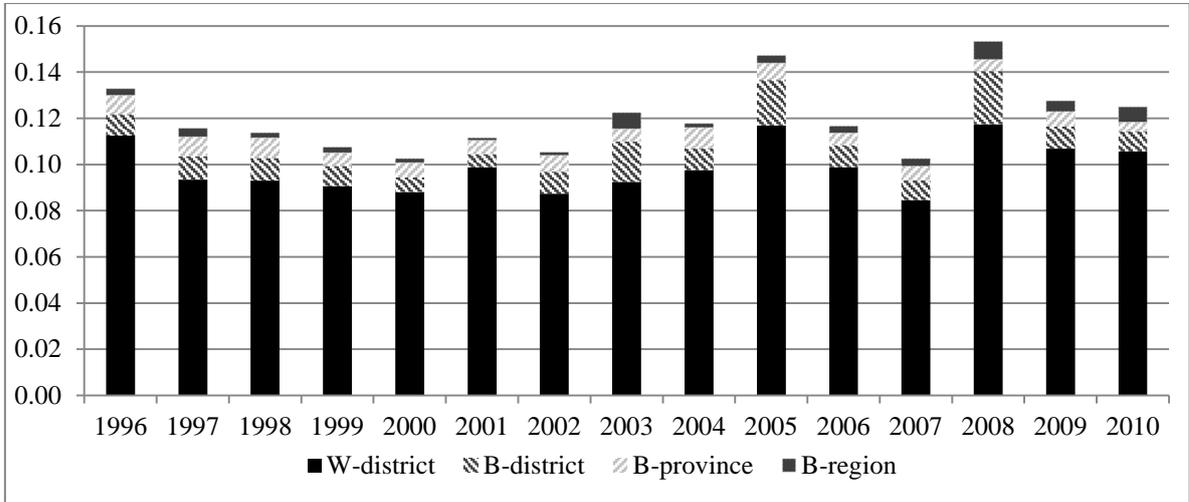


Figure 5-2. Hierarchical Decomposition of Urban Expenditure Inequality: Region-Province-District, Theil Index L

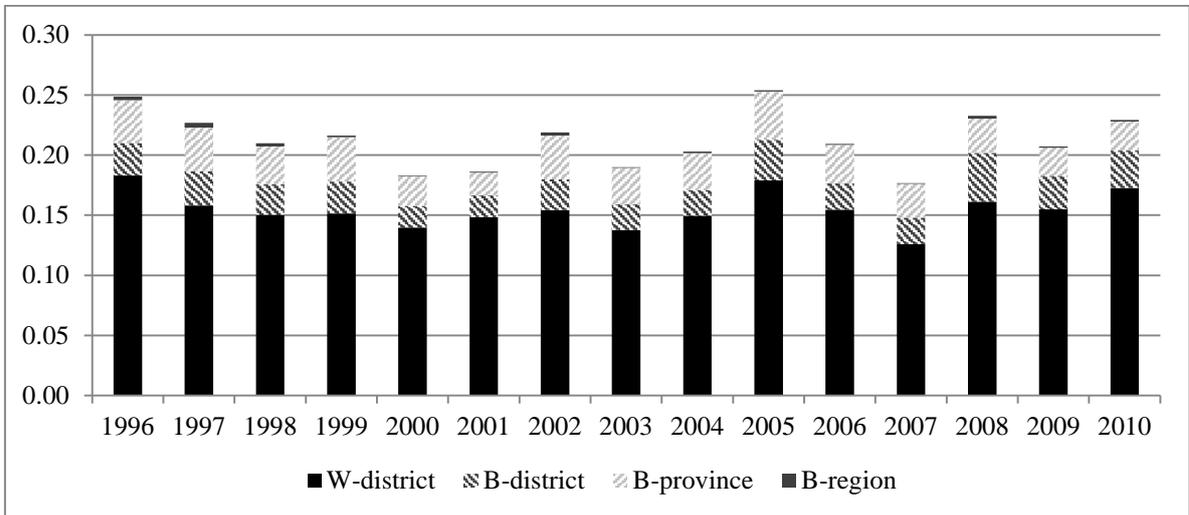


Figure 6-1. Distribution of Districts in the Rural Sector by Within-District Inequality in 2010, Theil Index L

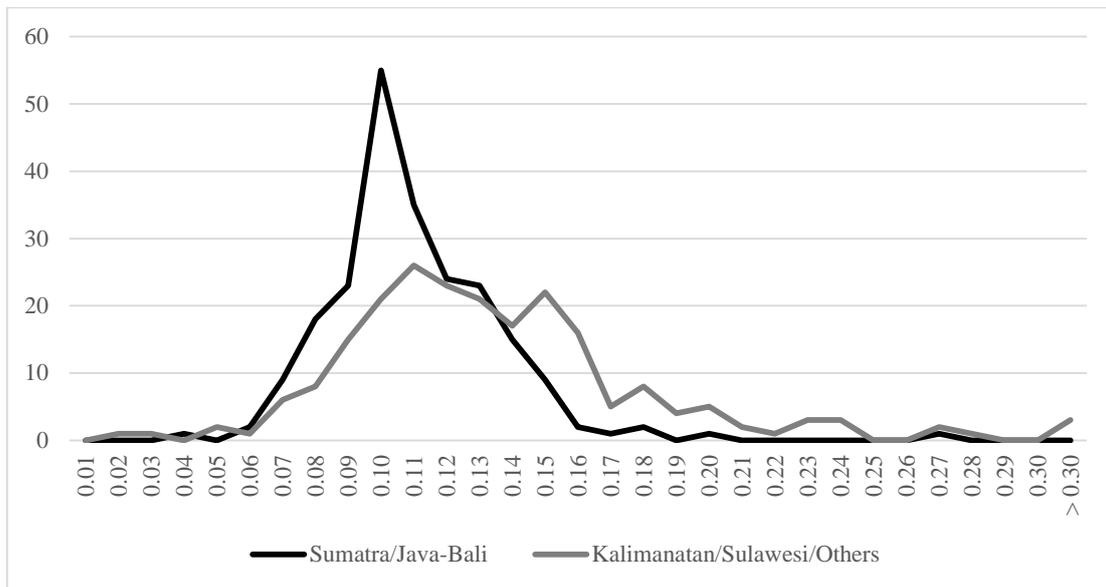


Figure 6-2. Distribution of Districts in the Urban Sector by Within-District Inequality in 2010, Theil Index L

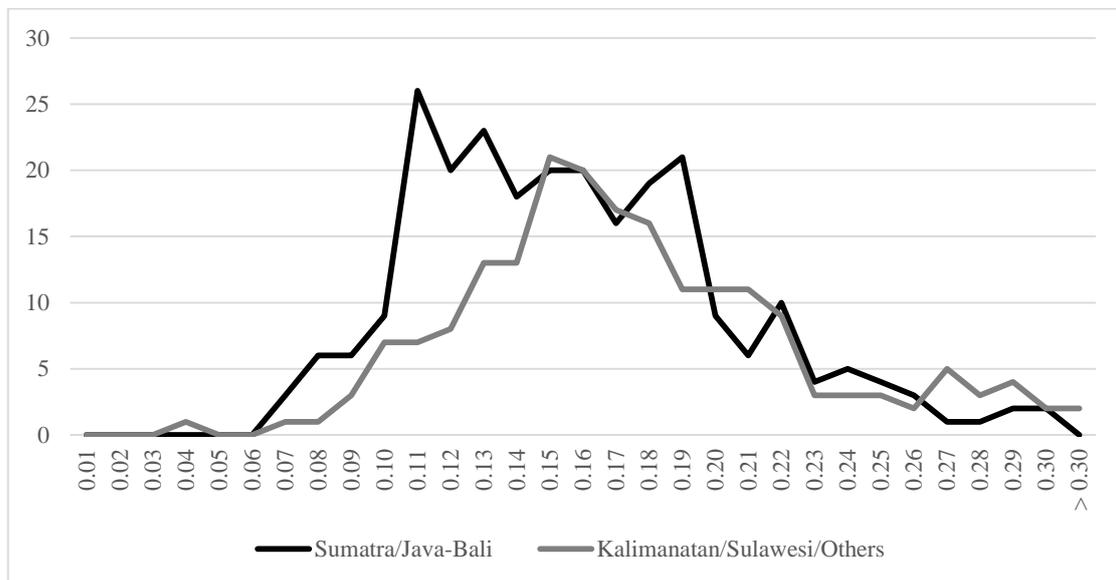


Table 1. Decomposition of Expenditure Inequality by Urban and Rural Sectors and by District in Each Sector, Theil Index L

	Inequality	Contrib. (%)	Pop. Share (%)		Inequality	Contrib. (%)	Pop. Share (%)
1996							
Total	0.233	100.0					
B-sector (BS)	0.058	25.0					
W-sector (WS)	0.175	75.0					
Urban	0.249	38.6	36.2	Rural	0.133	36.4	63.8
B-district (BD)	0.066	10.2		B-district (BD)	0.020	5.6	
W-district (WD)	0.183	28.4		W-district (WD)	0.112	30.8	
2000							
Total	0.166	100.0					
B-sector (BS)	0.030	17.8					
W-sector (WS)	0.137	82.2					
Urban	0.183	46.5	42.2	Rural	0.103	35.7	57.8
B-district (BD)	0.043	11.0		B-district (BD)	0.015	5.1	
W-district (WD)	0.140	35.5		W-district (WD)	0.088	30.7	
2005							
Total	0.248	100.0					
B-sector (BS)	0.055	22.1					
W-sector (WS)	0.193	77.9					
Urban	0.254	44.2	43.2	Rural	0.147	33.7	56.8
B-district (BD)	0.075	13.0		B-district (BD)	0.030	6.9	
W-district (WD)	0.179	31.2		W-district (WD)	0.117	26.8	
2007							
Total	0.172	100.0					
B-sector (BS)	0.038	21.9					
W-sector (WS)	0.134	78.1					
Urban	0.177	43.9	42.7	Rural	0.103	34.2	57.3
B-district (BD)	0.051	12.6		B-district (BD)	0.018	6.1	
W-district (WD)	0.126	31.3		W-district (WD)	0.084	28.1	
2008							
Total	0.228	100.0					
B-sector (BS)	0.037	16.0					
W-sector (WS)	0.192	84.0					
Urban	0.233	49.2	48.3	Rural	0.153	34.7	51.7
B-district (BD)	0.071	15.1		B-district (BD)	0.036	8.2	
W-district (WD)	0.161	34.2		W-district (WD)	0.117	26.6	
2010							
Total	0.218	100.0					
B-sector (BS)	0.041	18.9					
W-sector (WS)	0.177	81.1					
Urban	0.229	52.5	50.1	Rural	0.125	28.6	49.9
B-district (BD)	0.056	12.9		B-district (BD)	0.019	4.4	
W-district (WD)	0.173	39.6		W-district (WD)	0.106	24.1	

(Sources) *Susenas*, various issues.

Table 2. Hierarchical vs Non-hierarchical Decomposition of Expenditure Inequality
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	Hierarchical Decomposition		Non-hierarchical Decomposition	
	Inequality	Contribution (%)	Inequality	Contribution (%)
1996				
B-sector (BS)	0.058	25.0	0.058	25.0
B-district (BD)			0.082	35.1
Interaction term (ISD)			-0.045	-19.3
W-sector B-district (WSBD)	0.037	15.8		
W-sector W-district (WSWD)	0.138	59.2	0.138	59.2
Total	0.233	100.0	0.233	100.0
2000				
B-sector (BS)	0.030	17.8	0.030	17.8
B-district (BD)			0.049	29.7
Interaction term (ISD)			-0.023	-13.6
W-sector B-district (WSBD)	0.027	16.1		
W-sector W-district (WSWD)	0.110	66.1	0.110	66.1
Total	0.166	100.0	0.166	100.0
2005				
B-sector (BS)	0.055	22.1	0.055	22.1
B-district (BD)			0.091	36.7
Interaction term (ISD)			-0.042	-16.8
W-sector B-district (WSBD)	0.050	20.0		
W-sector W-district (WSWD)	0.144	57.9	0.144	57.9
Total	0.248	100.0	0.248	100.0
2007				
B-sector (BS)	0.038	21.9	0.038	21.9
B-district (BD)			0.063	36.8
Interaction term (ISD)			-0.031	-18.1
W-sector B-district (WSBD)	0.032	18.7		
W-sector W-district (WSWD)	0.102	59.4	0.102	59.4
Total	0.172	100.0	0.172	100.0
2008				
B-sector (BS)	0.037	16.0	0.037	16.0
B-district (BD)			0.080	35.1
Interaction term (ISD)			-0.027	-11.9
W-sector B-district (WSBD)	0.053	23.3		
W-sector W-district (WSWD)	0.139	60.7	0.139	60.7
Total	0.228	100.0	0.228	100.0
2010				
B-sector (BS)	0.041	18.9	0.041	18.9
B-district (BD)			0.070	32.1
Interaction term (ISD)			-0.032	-14.7
W-sector B-district (WSBD)	0.038	17.3		
W-sector W-district (WSWD)	0.139	63.8	0.139	63.8
Total	0.218	100.0	0.218	100.0

(Sources) *Susenas*, various issues.

Appendix

Table A1. Mean Per Capita Expenditure by Province (as % of Indonesia's Mean Per Capita Expenditure) and Population and Population Growth Rate by Province (in %)

Province	Mean Per Capita Expenditure (%)						Population (%)		
	1996	1999	2002	2005	2008	2010	2000	2010	GR
Sumatra									
North Sumatra	96	99	98	101	106	102	5.8	5.6	1.1
West Sumatra	104	110	105	103	108	105	2.1	2.1	1.3
Riau	123	118	138	137	143	135	2.5	3.1	3.8
Jambi	90	92	88	97	105	97	1.2	1.3	2.5
South Sumatra	87	88	76	88	104	97	3.5	3.7	2.0
Bengkulu	92	102	80	81	97	97	0.7	0.7	1.6
Lampung	74	79	72	76	88	80	3.3	3.3	1.2
Java-Bali									
Jakarta	242	250	254	256	219	206	4.2	4.1	1.4
West Java	115	103	103	102	101	106	21.8	23.0	2.0
Central Java	75	80	83	78	78	78	15.5	13.9	0.4
Yogyakarta	143	129	124	139	123	119	1.6	1.5	1.0
East Java	82	86	86	84	81	80	17.3	16.1	0.8
Bali	119	126	145	135	113	123	1.6	1.7	2.1
Kalimantan									
West Kalimantan	93	95	92	87	95	93	2.0	1.9	0.9
Central Kalimantan	109	107	104	92	103	115	0.9	0.9	1.8
South Kalimantan	106	101	103	108	119	114	1.5	1.6	2.0
East Kalimantan	141	119	139	152	168	154	1.2	1.5	3.7
Sulawesi									
North Sulawesi	88	101	97	113	95	94	1.4	1.4	1.6
Central Sulawesi	79	84	82	79	87	91	1.1	1.1	1.9
South Sulawesi	79	90	83	79	88	87	4.0	3.9	1.3
Southeast Sulawesi	79	77	79	76	78	83	0.9	1.0	2.0
Eastern Indonesia									
West Nusa Tenggara	71	81	76	74	78	77	2.0	1.9	1.2
East Nusa Tenggara	63	61	61	58	67	79	1.9	2.0	2.0
Maluku	77	80	107	89	100	100	1.0	1.1	2.6
Papua	86	82	150	111	110	108	1.1	1.5	4.8
Urban	147	135	136	138	128	128	42.0	49.9	3.2
Rural	73	77	74	71	74	72	58.0	50.1	0.0
Indonesia	100	100	100	100	100	100	100.0	100.0	1.5

(Sources) *Susenas*, various issues and Statistical Yearbook of Indonesia (2012).